

WHAT IS CLAIMED IS:

1. A human cell line, which lacks major histocompatibility class I (MHC-I) antigens and major histocompatibility class II (MHC-II) antigens and which has been modified to comprise and express (i) a gene encoding an immunomodulator and (ii) a gene encoding an antigen of Epstein-Barr virus (EBV).
2. The human cell line of claim 1, wherein the antigen of EBV is Epstein-Barr nuclear antigen-1 (EBNA1), latent membrane protein 1 (LMP1), or latent membrane protein 2 (LMP2).
3. The human cell line of claim 1 or 2, wherein the immunomodulator is a cytokine, a chemokine or an adjuvant.
4. The human cell line of claim 3, wherein the cytokine is an interferon, an interleukin, a tumor necrosis factor, erythropoietin, FLT-3 ligand, macrophage colony stimulating factor (M-CSF), granulocyte colony stimulating factor (G-CSF), or granulocyte-macrophage colony stimulating factor (GM-CSF).
5. The human cell line of claim 4, wherein interferon (IFN) is IFN α , IFN β or IFN γ .
6. The human cell line of claim 4, wherein the interleukin (IL) is IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-8, IL-10, IL-12 or IL-20.
7. The human cell line of claim 4, wherein the tumor necrosis factor (TNF) is TNF α or TNF β .
8. The human cell line of claim 3, wherein the chemokine is Mip1 α , Mip-1 β , Mip-3 α (Larc), Mip-3 β , Rantes, Hcc-1, Mpif-1, Mpif-2, Mcp-1, Mcp-2, Mcp-3, Mcp-4, Mcp-5, Eotaxin, Tarc, Elc, I309, IL-8, Gcp-2 Gro- α , Gro- β , Gro- γ , Nap-2, Ena-78, Gcp-2, Ip-10, Mig, I-Tac, Sdf-1, or Bca-1 (Blc).
9. The human cell line of claim 3, wherein the adjuvant is a heat shock protein or CpG.

10. The human cell line of claim 1, wherein the immunomodulator is GM-CSF and the antigen of EBV is LMP2.

11. The human cell line of claim 1 or 2, wherein the human cell line that is modified is K562.

12. The human cell line of claim 3, wherein the human cell line that is modified is K562.

13. The human cell line of claim 10, wherein the human cell line that is modified is K562.

14. A composition comprising a human cell line, which lacks MHC-I and MHC-II antigens and which has been modified to comprise and express a nucleotide sequence encoding an immunomodulator, and a human cell line, which lacks MHC-I and MHC-II antigens and which has been modified to comprise and express a nucleotide sequence encoding an antigen of EBV.

15. A composition comprising an immunomodulator and a human cell line, which lacks MHC-I and MHC-II antigens and which has been modified to comprise and express a nucleotide sequence encoding an antigen of EBV.

16. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human the human cell line of claim 1 or 2 in an amount sufficient to induce or stimulate an immune response to the EBV-associated cancer, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

17. The method of claim 16, wherein the human has or is at risk for Hodgkin's lymphoma.

18. The method of claim 16, wherein the human has or is at risk for nasopharyngeal carcinoma.

19. The method of claim 16, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

20. The method of claim 16, which further comprises quantifying the human's immune response to the antigen of EBV encoded by the human cell line before and after administration of the human cell line to the human and comparing the immune responses before and after administration, whereupon the immune response of the human to the antigen of EBV is characterized.

21. The method of claim 20, which further comprises adjusting the amount of the human cell line administered to the human and/or the frequency of administration of the human cell line as necessary in view of the human's immune response to the antigen of EBV, whereupon the treatment of the human is adjusted.

22. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human the human cell line of claim 3 in an amount sufficient to induce or stimulate an immune response to the EBV-associated cancer, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

23. The method of claim 22, wherein the human has or is at risk for Hodgkin's lymphoma.

24. The method of claim 22, wherein the human has or is at risk for nasopharyngeal carcinoma.

25. The method of claim 22, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

26. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human the human cell line of claim 10 in an amount sufficient to induce or stimulate an immune response to the EBV-associated cancer, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

27. The method of claim 26, wherein the human has or is at risk for Hodgkin's lymphoma.

28. The method of claim 26, wherein the human has or is at risk for nasopharyngeal carcinoma.

29. The method of claim 26, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

30. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human the human cell line of claim 11 in an amount sufficient to induce or stimulate an immune response to the EBV-associated cancer, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

31. The method of claim 30, wherein the human has or is at risk for Hodgkin's lymphoma.

32. The method of claim 30, wherein the human has or is at risk for nasopharyngeal carcinoma.

33. The method of claim 30, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

34. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human the human cell line of claim 12 in an amount sufficient to induce or stimulate an immune response to the EBV-associated cancer, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

35. The method of claim 34, wherein the human has or is at risk for Hodgkin's lymphoma.

36. The method of claim 34, wherein the human has or is at risk for nasopharyngeal carcinoma.

37. The method of claim 34, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

38. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human the human cell line of claim 13 in an amount sufficient to induce or stimulate an immune response to the EBV-associated cancer, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

39. The method of claim 38, wherein the human has or is at risk for Hodgkin's lymphoma.

40. The method of claim 38, wherein the human has or is at risk for nasopharyngeal carcinoma.

41. The method of claim 38, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

42. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human the composition of claim 14 in an amount sufficient to induce or stimulate an immune response to the EBV-associated cancer, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

43. The method of claim 42, wherein the human has or is at risk for Hodgkin's lymphoma.

44. The method of claim 42, wherein the human has or is at risk for nasopharyngeal carcinoma.

45. The method of claim 42, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

46. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human the composition of claim 15 in an amount sufficient to induce or stimulate an immune response to the EBV-associated cancer, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

47. The method of claim 46 wherein the human has or is at risk for Hodgkin's lymphoma.

48. The method of claim 46, wherein the human has or is at risk for nasopharyngeal carcinoma.

49. The method of claim 46, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

50. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human a human cell line, which lacks MHC-I and MHC-II antigens and which has been modified to comprise and express a nucleotide sequence encoding an immunomodulator, in an amount sufficient to induce or stimulate an immune response, and simultaneously or sequentially, in either order, by the same route or a different route, a human cell line, which lacks MHC-I and MHC-II antigens and which has been modified to comprise and express a nucleotide sequence encoding an antigen of EBV, in an amount sufficient to induce to stimulate an immune response, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

51. The method of claim 50, wherein the human has or is at risk for Hodgkin's lymphoma.

52. The method of claim 50, wherein the human has or is at risk for nasopharyngeal carcinoma.

53. The method of claim 50, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.

54. A method of inducing or stimulating an immune response in a human to an EBV-associated cancer, which method comprises administering to the human an immunomodulator in an amount sufficient to induce to stimulate an immune response, and simultaneously or sequentially, in either order, by the same route or a different route, a human cell line, which lacks MHC-I and MHC-II antigens and which has been modified to comprise and express a nucleotide sequence encoding an antigen of EBV, in an amount sufficient to induce to stimulate an immune response, whereupon an immune response to the EBV-associated cancer is induced or stimulated.

55. The method of claim 54, wherein the human has or is at risk for Hodgkin's lymphoma.

56. The method of claim 54, wherein the human has or is at risk for nasopharyngeal carcinoma.

57. The method of claim 54, wherein the human has or is at risk for gastric carcinoma, Burkitt's lymphoma, T-cell lymphoma, B-cell lymphoma, parotid carcinoma, breast carcinoma, and leiomyosarcoma.